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ABSTRACT

Numerous elements impact the educational system in an area as large and as diverse as the Northwest, including demographics, learning opportunities for teachers and students, student achievement, and funding. This document summarizes a sampling of the factors that influence mathematics and science education in the Northwest. It is intended to stimulate educators' interest in how various regional indicators impact classroom practice such as population growth, minority representation, certification, and state policy, among others. The five sections of this document include: (1) Demographic Highlights of the Northwest Region; (2) Assessment; (3) Student Participation in Mathematics and Science; (4) Mathematics and Science Teachers; and (5) Teacher Certification. It is concluded that this depiction of Northwest teachers combined with evidence of changes in student population, achievement, and curricula point to the need for far-reaching, high quality professional support such as the Northwest Regional Educational Laboratory (NWREL) continues to provide the Northwest region. By continuing to provide information on various interacting components of the regional education system, reform efforts can be based on current conditions. (JRH)

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Annual Depiction of

SCIENCE and MATHEMATICS EDUCATION

in the Northwest

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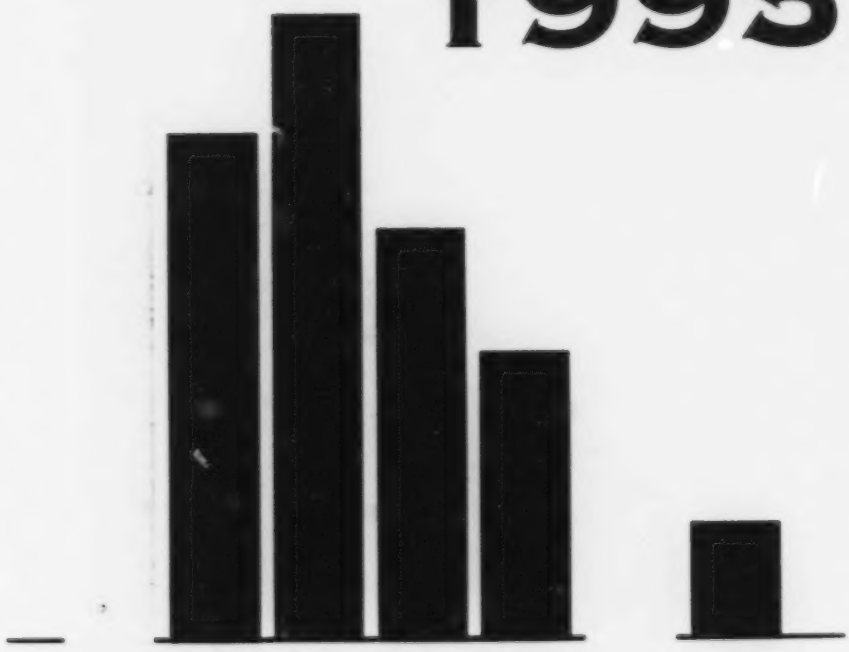

Northwest Regional Educational Laboratory

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Northwest Regional Educational Laboratory
101 S.W. Main Street, Suite 500
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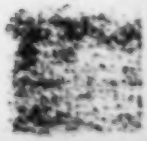

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INTRODUCTION

To better serve the Northwest region, the Northwest Regional Educational Laboratory (NWREL) seeks to understand the interaction of factors influencing education in schools throughout Alaska, Idaho, Oregon, Montana, and Washington. Numerous elements impact the educational system in an area as large and as diverse as the Northwest, including demographics, learning opportunities for teachers and students, student achievement, and funding. The unique interplay of these components influences mathematics and science education as well as the entire educational system. By collecting data on a wide spectrum of these dimensions, NWREL can (1) better meet emerging needs to improve mathematics and science learning, (2) provide meaningful support for systemic educational change, and (3) develop effective strategies for working with teachers and students.

For several years, NWREL's science and mathematics component has continued to compile information from numerous sources to create a regional annual depiction of science and mathematics education. Sources include databases and publications from NWREL, national education institutions, state departments of education, and professional math and science organizations. After reviewing available data and overlaying the context of the Northwest, five broad dimensions were selected as key factors to understanding mathematics and science education in the Northwest: **demography, assessment, student participation, mathematics and science teachers, and certification**. The *Annual Depiction of Science and Mathematics Education in the Northwest 1995* summarizes a sampling of factors that influence mathematics and science education in the Northwest, and is intended to stimulate educators' interest in how various regional indicators impact classroom practice, such as population growth, minority representation, certification, and state policy, among others. Forming a broader perspective of regional data allows education stakeholders to draw meaningful comparisons and inferences.

Although the five key dimensions emphasized in this document are only a few of myriad interacting elements, they provide valuable insight

to the Northwest from several vantage points, and provide the framework for this publication through the utilization of supportive tables, figures, results, and findings. **Section I—Demographic Highlights of the Northwest Region** includes Tables 1.1 through 1.4 and Figure 1.1. **Section II—Assessment** includes Tables 2.1 through 2.3 and Figures 2.1 through 2.3. Table 3.1 in **Section III—Student Participation** captures data about student participation in mathematics and science. **Section IV—Mathematics and Science Teachers** reviews the participation of practitioners in the field and in professional associations on Tables 4.1 through 4.3. **Section V—Certification** outlines teacher certification in the five Northwest states in Tables 5.1 through 5.5.

As data was gathered to develop this *Annual Depiction of Science and Mathematics Education in the Northwest 1995*, various issues, ideas, and challenges also emerged. For example, student performance information was of particular interest because each Northwest state has different focal areas that compare students with standardized tests. Recognizing the difficulties with nationally normed tests, Northwest states continue to develop their own alternative assessments, open-ended performance assessments, or state learning assessments. By tying the assessments more closely with state curricula and emphases at given grade levels, each state can draw a more accurate profile of where and how students in each state are succeeding. In addition, Northwest states do not maintain data on teaching certificates in the same way nor do they have a standard way of reporting such information. For example, in Alaska, licensure is granted on the recommendation of the higher educational institution. In Oregon, the Teacher Standards and Practices Commission (TSPC) operates semi-independently of the state department of education. Extracting certification records and trends is not an easy task because the data is not typically reported in state publications or other annual reports. However, this information is critical to teacher preparation institutions, prospective teachers, and schools that anticipate future hiring needs. NWREL continues to track trends, data, and processes that impact teacher preparation and certification in order to offer Northwest educators insight to evolving science and mathematics education in their regions.

The information included in this depiction raises some important points to further explore: virtually all elementary teachers teach mathematics and science; over 62 percent of Northwest teachers (K-12) are responsible for teaching math and/or science, yet in spite of the high percentage, teachers' membership in professional math and science associations is very low; most teachers feel less confident about teaching math and science than teaching reading and language arts, and therefore spend less classroom time on both subjects, particularly science. The region must continue to explore how to increase teachers' enthusiasm, confidence, and teaching skills in both mathematics and science. Some of the many topics that emerged during the development of the *Annual Depiction of Science and Mathematics Education in the Northwest 1995* may be addressed in future annual depictions, such as course-taking patterns; ethnicity and gender; how rural schools leverage resources, funds, and personnel; and teacher preparation data.

Whether readers are teachers, teacher educators, school board members, or mathematics and science specialists, the *Annual Depiction of Science and Mathematics Education in the Northwest 1995* encourages education stakeholders to examine emerging trends in science and mathematics education across adjacent Northwest states. **Although this initial depiction reflects last year's data, the information is current and offers an interesting and useful cross-state analysis of the changing facets of mathematics and science education in the Northwest.** The Northwest Regional Educational Laboratory anticipates that the distribution of future depictions will continue to help inform the region about educational improvement, enhance NWREL's capacity to provide meaningful support for systemic educational change, and develop more effective strategies for working with teachers and students.

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DEMOGRAPHIC HIGHLIGHTS OF THE NORTHWEST REGION

The *Educational Needs of the Northwest: 1994 Annual Report*, prepared by the Planning and Service Coordination Program of the Northwest Regional Educational Laboratory, provides an excellent overview of the geographic and economic context of the Northwest region. Some of the demographic information taken from that regional assessment is presented in Tables 1.1 and 1.2 and Figure 1.1.

POPULATION

One critical component of demography is population, which clearly impacts school enrollment and the need for teachers and school funding. With almost 11 million people living in the five Northwest states, the population density varies greatly. Again, the density and distribution of the region's population impacts the nature of schools and their funding. Population, density, and the urban concentration of Northwest states depicted in Table 1.1 are drawn from NWREL's *Educational Needs of the Northwest: 1994 Annual Report*. The largest state population resides in the region's smallest state, Washington. The smallest state population inhabits the largest geographic state, Alaska. A large proportion of the population lives in the I-5 and I-405 corridor between the greater Seattle/Tacoma metropolitan area in Washington south to the Eugene vicinity in Oregon.

TABLE 1.1

POPULATION, DENSITY, AND PERCENTAGE LIVING IN URBAN AREAS*

	1993 Population	1993 Density (persons per sq. mile)	% Urban *
Alaska	599,000	1.1	67.5
Idaho	1,099,000	13.3	57.4
Montana	839,000	5.8	52.5
Oregon	3,032,000	31.6	70.5
Washington	5,255,000	78.9	76.4
U.S.	257,908,000	72.9	75.2

* Urban areas are places of 2,500 or more inhabitants incorporated as cities, villages, or boroughs (except in Alaska) and towns.

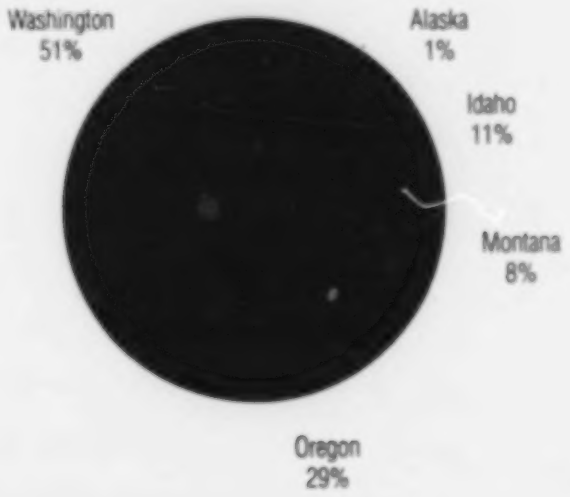
Sources: Population data from Table 26; density data from Table 27; and percent urban data from Table 44, *Statistical Abstracts of the United States*, 1994, Bureau of Census.

Although four out of the five Northwest states have low population density, their residents tend to be concentrated in urban areas. The states with the highest percentage of people living in urban areas are Washington, Oregon, and Alaska. In Idaho and Montana, the population is more evenly distributed between urban and rural areas, and the scale of urban areas tends to be smaller. Urban areas in Montana are Missoula, Great Falls, and Billings. Large cities in Idaho include Boise, Idaho Falls, and Pocatello. The diversity of population density in the Northwest impacts schools and the general character of the school community. Tax base issues and isolation are examples of conditions partially driven by population density. Student enrollment parallels total population of the states, as Figure 1.1 illustrates.

FIGURE 1.1

POPULATION DISTRIBUTION OF THE NORTHWEST

DISTRIBUTION OF 1993 TOTAL POPULATION



DISTRIBUTION OF 1993/94 K-12 STUDENT ENROLLMENT

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POPULATION DISTRIBUTION OF THE NORTHWEST

State	Population	K-12 Enrollment
Alaska	599,000	119,201
Idaho	1,099,000	236,774
Montana	839,000	163,020
Oregon	3,032,000	915,694
Washington	5,255,000	1,976,289

ENROLLMENT

Between 1990 and 1993, the population grew at a faster rate in the Northwest than the national average. Although moderating, the population of the region continues to grow. Correspondingly, public school enrollment grew throughout the 1990s, and student enrollment steadily increased in Idaho, Oregon, and Washington between 1990 and 1994. Enrollments in Alaska and Montana decreased and remained stable respectively during the 1991-1992 school year, but have continued to grow since. Enrollments are predicted to continue to increase, although more slowly than in the past five years. Table 1.2 documents recent enrollment patterns and the minority status of Northwest students.

TABLE 1.2

NORTHWEST PUBLIC SCHOOL ENROLLMENT DATA

				% 1993-'94 Student Population [a]					
	1990-'91	1991-'92	1993-'94	Asian/ Pacific	Black	Hisp.	Native Amer.	Total Minority	Total White
State	Total # [a]	Total # [a]	Total # [b]						
AK	116,000	110,366	119,201	3.6	4.4	1.9	22.4	32.3	67.7
ID	215,000	220,840	236,774	0.8	0.3	4.9	1.3	7.3	92.7
MT	152,000	152,000	163,020	0.7	0.3	1.2	9.2	11.4	88.6
OR	469,000	476,522	541,600	2.8	2.4	4.0	1.7	10.9	89.1
WA	827,000	827,000	915,694	5.3	4.1	4.8	2.4	16.6	83.4
Total K-12	1,779,000	1,786,728	1,976,289						

Sources:
[a] *Educational Needs of the Northwest: 1993 Annual Report*, NWREL
[b] State Publications: Alaska—*Alaska Educational Directory, 1993-1994*, AK State Board of Education; Idaho—*Idaho Educational Directory, 1994-1995*, IDE; Montana—*1994-1995 Directory of Montana Schools*, OPI; Oregon—*Oregon Report Card 1993-1994*, ODE; Washington—*Public Elementary and Secondary Educational Statistics: School Year 1993-1994*, NCES; *School District Worksheet by County and District*, SPI

ETHNICITY

Compared to other regions of the United States, there's a small percentage of minority students in the Northwest. However, as noted in the *Educational Needs of the Northwest: 1994 Annual Report*, "Compared with the U.S. average [Northwest states] showed a faster than average growth rate in minority population. Montana had the highest rate of increase going from 7 percent minority to 12 percent from 1986 to 1992. Washington followed with a change from 16 percent to 19 percent minority. Oregon increased from 10 percent to 13. For the United

States the percentage of minority students grew from 30 percent to 33 percent." During the 1993-1994 school year, the largest minority enrollments were found in Alaska, with 22.4 percent Native American students and 32.3 percent total minority students. These percentages have remained stable for the last decade. The most homogeneous state was Idaho, with a total minority population of 7.3 percent. Clearly, the percentage of minority students in the Northwest region remains small. However, the impact of the growth in this portion of the population may still be great. The central city districts in the urban corridor have minority enrollments up to nearly 40 percent. Communities will increasingly encompass more diverse perspectives that will be reflected in the schools. Teachers in the Northwest will need to adapt and strengthen strategies of inclusiveness to keep up with a changing student population.

Pupils, Districts, Schools, and Teachers by State

Table 1.3 gives a broad view of students, schools, and teachers in the Northwest. The region as a whole educates almost two million K-12 students. Students occupy over 5,000 schools, with approximately 100,000 teachers working with pupils in the Northwest. The population of the Northwest is unevenly distributed, with the smallest student population inhabiting the largest state, Alaska, and the largest student population residing in the smallest state geographically, Washington. The student population of Washington alone accounts for 46% of all Northwest students. Numbers of teachers parallel student enrollment, with student to teacher ratios ranging from about 15 to one in Alaska to 20 to one in Idaho and Washington. The impact of recently reduced school funding in some states, such as Oregon, may have a profound impact on these student to teacher ratio.

TABLE 1.3

THE NORTHWEST REGION'S PUPILS, DISTRICTS, SCHOOLS, AND TEACHERS BY STATE 1993-1994

State	Total Pupils [a]	Total School Districts [b]	Total Schools [c]	Total Teachers [d]	Student: Teacher Ratio
Alaska	119,201	54	491	7,846	15:1
Idaho	236,774	112	571	11,807	20:1
Montana	163,020	353 (481)*	899	9,900	18:1
Oregon	541,900	246	1,229	28,342	19:1
Washington	915,694	296	1,843	45,000	20:1
Regional Total	1,976,289	1,061	5,033	102,913	19:1

Sources:
[a] Alaska—State Directory, 1993-1994; Idaho and Montana—State Directories, 1994-1995; Oregon—*Oregon Report Card 1993-1994*; Washington—School District Worksheet by County and District, 1994
[b] Idaho, Montana, Oregon, and Washington—School Directories, 1994-1995; Alaska—School Directory, 1993-1994
[c] *Educational Needs of the Northwest: 1994 Annual Report*. Portland, OR: Northwest Regional Educational Laboratory
[d] Alaska—Alaska Department of Education, data for 1994-1995; Idaho and Montana—CCSSO *Indicators Report, 1994*; Oregon—*Oregon Report Card 1993-1994*; Washington—Office of the superintendent of Public Instruction
*353 Administrative Units, 481 Budgeting and Fiscal Districts

School Funding

School funding across the Northwest varies widely. However, a recent NWREL analysis of school funding reported in *How Money Matters to School Improvement* found that most regional school districts allocate funds in a comparable manner with the highest proportion of money going to instructional services. Clearly, differences in districts' local wealth and needs provide for a range of per pupil expenditures within each state. While per pupil expenditures is only one factor impacting

student learning, it does have an impact. States with fewer expenditures per student typically minimize the range of learning opportunities.

FINDINGS

Table 1.4 lists estimated per pupil expenditures for the 1993-1994 school year by state, and ranks the states by expenditure per pupil, including the District of Columbia and the United States average. The five Northwest states accented in bold letters emphasize their span across the funding spectrum. The average amount of per pupil expenditures ranges from about $7,721 in Alaska to $3,540 in Idaho. Alaska and Washington are above the nation's average expenditure. Oregon is very close to the mean for all states. Montana and Idaho are below the mean. The amount of per pupil spending in Idaho was estimated to be less than half the expenditure per pupil in Alaska

TABLE 1.4

ESTIMATED PER PUPIL EXPENDITURE AND RANK ORDER BY STATE 1993-1994

State	Per Pupil Expenditure	Rank
New Jersey	9,429	1
District of Columbia	8,057	2
ALASKA	**7,721**	**3**
Connecticut	7,558	4
New York	7,642	5
Vermont	6,867	6
Pennsylvania	6,804	7
New Hampshire	6,426	8
Rhode Island	6,409	9
Massachusetts	6,361	10
Maryland	6,117	11
Michigan	5,989	12
West Virginia	5,782	13
Delaware	5,779	14
Wisconsin	5,779	15
Hawaii	5,620	16
Minnesota	5,610	17
Ohio	5,570	18
Wyoming	5,550	19
WASHINGTON	**5,537**	**20**
Maine	5,439	21
Nebraska	5,410	22
U.S.A.	5,314	23
Illinois	5,299	24
OREGON	**5,246**	**25**
Iowa	5,217	26
Virginia	5,169	27
Indiana	5,096	28
Kansas	5,087	29
Texas	4,926	30

State	Per Pupil Expenditure	Rank
Florida	4,893	31
MONTANA	**4,788**	**32**
Kentucky	4,660	33
California	4,623	34
Colorado	4,584	35
Nevada	4,547	36
North Dakota	4,497	37
Louisiana	4,402	38
Missouri	4,391	39
North Carolina	4,388	40
Arizona	4,182	41
Georgia	4,179	42
New Mexico	4,150	43
South Carolina	4,083	44
Tennessee	4,053	45
Oklahoma	3,930	46
South Dakota	3,874	47
Alabama	3,757	48
Arkansas	3,556	49
IDAHO	**3,540**	**50**
Mississippi	3,231	51
Utah	3,158	52

All numbers are state estimates reported as of January 1994.

Source: U.S. Department of Education, NCES, Common Core of Data

ASSESSMENT

Coinciding with national initiatives, educators in the Northwest region are rethinking how to best measure student learning. The type and nature of assessment tools, their purpose, and the consequences of assessment for students are being re-evaluated. Oregon and Idaho are developing statewide open-ended assessments, and an array of traditional assessment tools and alternative assessment practices are being used across the region. The continuing expansion of the goals and tools used to measure achievement will undoubtedly broaden the scope of what is measured in student learning

Nationally developed tests in mathematics and science are riddled with problems. Not specific to curricula taught in Northwest schools, they measure learning in ways that aren't always valued by local educators or emphasized in the curricula. At the high school level, not all students are assessed, especially in college entrance exams. However, with consideration of their drawbacks, standardized tests do provide a rough baseline on student achievement. Three major categories of tests are used to depict student learning in the Northwest: (1) standardized achievement tests, such as the Iowa Test of Basic Skills; (2) the National Assessment of Educational Progress (NAEP) Trial State Assessment; and (3) the College Entrance Examination Board's Scholastic Assessment Tests (SAT). Results from these assessments are shown in Tables 2.1 through 2.3 and Figures 2.1 through 2.3.

Standardized Achievement Tests

To gain perspective on student achievement in mathematics and science, standardized test scores were compared across states and grade levels. It is difficult to show gains with norm-referenced tests like the achievement tests. The rate of growth is the same for the norming population and the general population of students. Therefore, in order to demonstrate progress, Northwest students would have to progress at an even faster rate than the average student in the norming sample. Another consideration when drawing conclusions from achievement tests is that in the Northwest about two-thirds the number of math stu-

dents take the science tests. This makes comparing science scores to math scores somewhat less reliable. With these considerations in mind, the following tables and figures address assessment in math and science.

Assessment Tools

To assess student learning in mathematics, the Northwest states use various assessment tools. The Iowa Test of Basic Skills (ITBS) is used by Alaska, Idaho, and some districts in Montana. Montana also uses six other standardized tests at the discretion of each district. This diversity of assessment tools makes the problem of equating tests particularly difficult in the case of Montana. Washington uses the Comprehensive Test of Basic Skills (CTBS) and the Curriculum Frameworks Assessment System (CFAS) for 11th-graders. Oregon uses its own battery of tests called the Oregon Statewide Assessment with other tests used by district choice. A complete list of tests used in the Northwest follows:

TABLE 2.1

ACHIEVEMENT TESTS USED FOR AVERAGE ACHIEVEMENT PERCENTILES

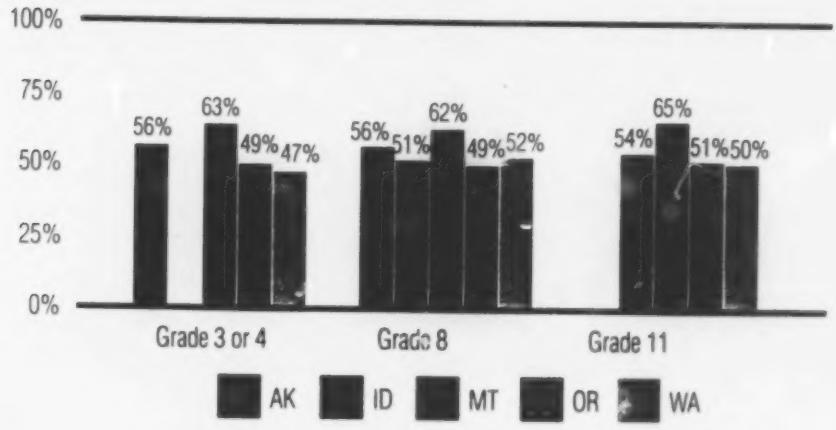
State	Testing Requirements	Grades Tested	Test Type	Total # Tested	Data Used
Alaska	Statewide testing required	4 6 8	ITBS, Form G ITBS, Form G ITBS, Form G	26,000	1992-'93
Idaho	Statewide testing required	6 8 11	ITBS ITBS TAP	48,100	1992-'93
Montana		3 or 4 8 11	CAT, CTBS, ITBS, SRA, STANFORD CAT, CTBS, ITBS, MAT, STANFORD CTBS, MAT, TASK, TAP	33,200	1992-'93
Oregon	Statewide testing required	3 5 8 11	Oregon Statewide Assessment	198,500	1993-'94
Washington		4 8 11	CTBS CTBS CFAS	178,500	1992-'93

CAT—California Achievement Test; CFAS—Curriculum Frameworks Assessment System; CTBS—Comprehensive Test of Basic Skills, 4th Edition; ITBS—Iowa Test of Basic Skills, Form G; MAT—Metropolitan Achievement Test Stanford; TAP—Tests of Achievement and Proficiency

MATHEMATICS ACHIEVEMENT

FIGURE 2.1

COMPARISON OF MATH AVERAGE ACHIEVEMENT PERCENTILES BY GRADE LEVEL AND STATE



RESULTS REPORTED

Testing results are graphed by grade groups using third or fourth grade for elementary data, eighth grade for middle school, and 11th for high school statistics. Results of each test are charted by average percentile rank. This statistic was derived by converting the percentile rank for each test from each state to a Normal Curve Equivalent (NCE). An average NCE was then calculated by factoring in the number of students tested in each state. The average NCE was then converted back to an average percentile rank.

FINDINGS

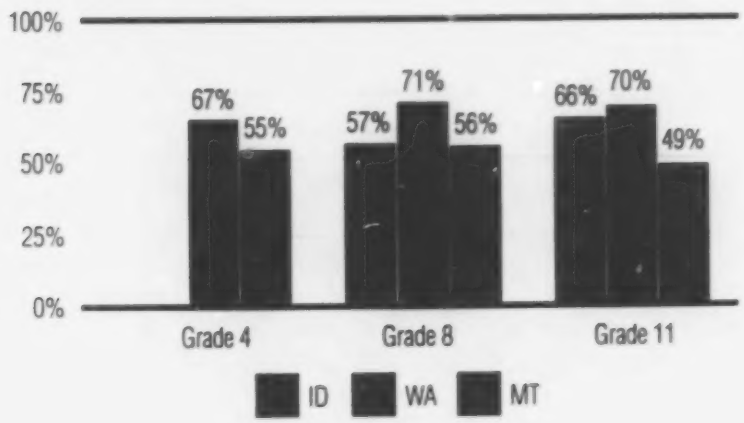
Although comparisons between states should be made with caution, the percentile ranks do provide a general perspective on how students

in the Northwest region compare nationally. Overall, students scored about average in mathematics across all grade levels. By 11th grade most students scored better than half the 11th-grade math students in the country. Montana stands out as scoring better than over 60 percent of U.S. math students across grade levels. The percentile ranks indicate a trend toward higher scores moving from elementary school to high school.

Science Achievement

FIGURE 2.2

COMPARISON OF NORTHWEST SCIENCE ACHIEVEMENT PERCENTILES BY GRADE LEVEL AND STATE



ASSESSMENT TOOLS

As previously emphasized, to assess student learning in science the Northwest states use a variety of assessment tools. Currently, Alaska and Oregon are not using a statewide or standardized test to measure student learning in science. In Idaho, the Iowa Test of Basic Skills

(ITBS) is used. In Montana, the ITBS is used through the eighth grade. Tests of Achievement and Proficiency (TAP) are used in 11th grade by Montana. Montana also uses six other standardized tests at the discretion of each district. The diversity in tests may make the problem of equating tests particularly difficult in the case of Montana. Washington uses the Comprehensive Test of Basic Skills (CTBS) as well as the Curriculum Frameworks Assessment System (CFAS) in 11th grade. A complete list of tests is outlined on Table 2.1.

RESULTS REPORTED

Results are graphed by grade groups using fourth grade for elementary data, eighth grade for middle school, and 11th for high school statistics. As with the math data, results of each test have been reported on Figure 2.2 by average percentile rank. This statistic was derived by converting the percentile rank for each test from each state to a Normal Curve Equivalent (NCE). An average NCE was then calculated by factoring in the number of students tested in each state. The average NCE was then converted back to an average percentile rank. The percentile rank provides a rough picture of how students in the Northwest compare with a national sample of students.

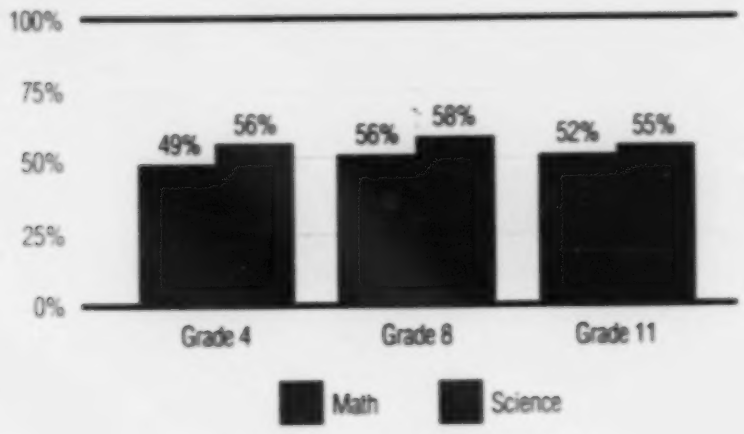
FINDINGS

The variety of tests used and differences in norm referencing means comparisons between states should be made with caution. However, the percentile ranks do provide a general perspective on how students in the Northwest compare nationally. Generally, students across grade levels did better than the average U.S. students in science. Montana students fared better than other students in their science assessments. Middle and high school students in Montana scored better than 70 percent of U.S science students at comparable grade levels. Eleventh-grade students in Idaho were at a higher percentile rank than eighth-graders. However, in Washington the opposite was true, with 11th-graders at a lower percentile rank than the eighth-graders. Although the testing is limited in the number of participating students and states, Northwest students tended to score at a higher percentile rank in science than mathematics.

NORTHWEST MATHEMATICS AND SCIENCE ACHIEVEMENT

FIGURE 2.3

COMPARISON OF NORTHWEST MATH AND SCIENCE AVERAGE ACHIEVEMENT PERCENTILES BY GRADE LEVEL



RESULTS REPORTED

Results are graphed by grade groups using third or fourth grade for elementary data, eighth grade for middle school, and 11th for high school statistics. Results of each test have been reported in Figure 2.3 by average percentile rank. This statistic was derived by converting the percentile rank for each test from each state to a Normal Curve Equivalent (NCE). An average NCE was then calculated by factoring in the number of students tested in each state. An average NCE for the Northwest (all five states averaged together) by subject area and grade level was then derived. The average NCEs were then converted back to an average percentile rank.

FINDINGS

The percentile rank provides a rough picture of how students in the Northwest compare with a national sample of students. Overall, students did slightly better than half the comparable U.S. students. Northwest students scored better in science than in mathematics. This is especially apparent at the elementary and middle levels. By 11th grade the difference is greatly reduced. Eighth-grade students scored at or above the percentile rank for other grades, doing better than almost 60 percent of U.S. eighth-graders on science achievement tests.

National Assessment of Educational Progress (NAEP)

TABLE 2.2

GRADE 8 AVERAGE NAEP MATHEMATICS PROFICIENCY BY GENDER

Grade 8 Public Schools	Female		Male	
	% Achieving Avg. Proficiency (S.E.)*	Avg. Proficiency	% Achieving Avg. Proficiency (S.E.)*	Avg. Proficiency
Idaho	48 (1.2)	270 (0.8)	52 (1.2)	273 (0.9)
Montana	49 (1.4)	277 (1.2)	51 (1.4)	284 (1.1)
Oregon	48 (0.9)	271 (1.0)	52 (0.9)	272 (1.3)
Nation	49 (1.1)	260 (1.3)	51 (1.1)	262 (1.8)

* The standard errors of the estimated percentages and proficiencies appear in parenthesis. It can be said with 95 percent certainty that for each population of interest, the value for the whole population is within plus or minus two standard errors of the estimate for the sample.

ASSESSMENT TOOLS

The 1990 NAEP Trial State Assessment Program measured student learning through a representative sample of students in 38 states, Guam, and the Virgin Islands. "The results can be used by each state to determine in a general sense what its students know and can do in mathematics and how this compares to the nation and other states." (*The State of Mathematics Achievement*, 1991 p.5)

Responses to the assessment were analyzed by 19 distinguished mathematics educators to develop a proficiency scale. The scale ranges from zero to 500. The panel characterized a Level 200 proficiency as material typically covered by the third grade, Level 250 as material generally covered by the fifth grade, Level 300 as content in the seventh grade, and Level 350 as content generally covered in high school mathematics courses in preparation for the study of advanced mathematics.

RESULTS REPORTED

The findings from the assessment are reported in Table 2.2 for eighth-grade students, and are broken down by gender and participating Northwest state. For each subgroup, results are given by the percentage of students who demonstrated proficiency at a particular level. Standard errors are indicated in parentheses.

FINDINGS

The figures reveal that the results of the assessment of eighth-grade students in the Northwest parallels the nation as a whole. Approximately half of the Northwest students performed with an average proficiency above 270. This is, overall, about 10 points higher than the national average. However, according to NAEP, the average is still below the content level typically covered in eighth grade (above a Level 300 proficiency). Students from Montana demonstrated higher average proficiency than other students. This scoring pattern for Montana was evident in other NAEP tests as well, perhaps indicating Montana's curricula is more closely matched to the content of the

NAEP test. Again coinciding with national findings, male students scored higher on the test than females in all states.

Scholastic Assessment Tests (SAT)

TABLE 2.3

OVERALL SAT AVERAGES BY NORTHWEST STATES

State	Year 1992	1993	1994	% Grads. Taking SAT*	% Male/Female
Alaska	475	477	477	49	46/54
Idaho	503	507	508	16	46/54
Montana	523	516	523	21	45/55
Oregon	486	492	491	53	47/53
Washington	484	486	488	49	47/53

* Based on number of high school graduates in 1993 as projected by the Western Interstate Commission for Higher Education, and number of students in the class of 1994 who took the SAT.

Source: College Board, 1994

ASSESSMENT TOOLS

The Scholastic Assessment Tests (SAT) is designed to measure verbal and quantitative reasoning skills related to academic performance in college. Results are reported on a scale of 200 to 800 on separate math and verbal subtests. Students tested are primarily high school seniors, although a growing number of juniors take the SAT. The scores are intended to predict college academic performance of individual students. Many complex factors, such as educational background, gender, racial/ethnic background, parental education, and household income are associated with scores on the SAT.

RESULTS REPORTED

The data presented in Table 2.3 tracks SAT scores for the five Northwest states in three years, 1992-1994. Math and verbal scores have been averaged to determine an overall SAT mean. Table 2.3 also indicates the percentage of students taking the SAT in each state and the percentage of students taking tests who were male and female.

FINDINGS

Scores appear quite stable over the past few years, with slight increases evident overall between 1992 and 1994. The percentage of students taking the SAT varies widely across the region. In Idaho 16 percent of potential students took the SAT, in Washington and Alaska 49 percent, and in Oregon 53 percent took the tests. This is the most significant factor to consider in interpreting the SAT. The percentage of students taking the SAT in a state depends on the entrance requirements of state institutions of higher learning and the number of students applying to selective colleges and scholarships nationwide. The percentages of male and female students who take the SAT are consistent across states, with more females than males taking the test. Although not reported in Table 2.3, other interesting patterns emerge when reviewing SAT scores and students in the region. Most Northwest students who take the SAT completed high school classes in geology, chemistry, algebra, and geometry. Students scoring highest on the SAT took physics and/or calculus. In Idaho, Montana, and Oregon, twice as many male as female students who took the SAT took computer math.

STUDENT PARTICIPATION IN MATHEMATICS AND SCIENCE

The extent of participation by students in mathematics and science classes is difficult to measure and track. All Northwest states require that mathematics and science be taught throughout elementary and middle school, and that at least two years of high school mathematics and science be required of all students.

The length of time spent on a subject, the nature of classes, and content covered are variables over which individual teachers have a high degree of discretion. Numerous districts and local education agencies have collected profiles about the nature and content of elementary mathematics and science classes. The complex data is difficult to characterize, and is not reported here. However, one indicator of the priority placed on subjects in elementary school is the amount of time spent on the subject in an average week. Table 3.1 provides an estimate of hours spent teaching mathematics and science by teachers during a typical week.

Elementary Class Time on Mathematics and Science

TABLE 3.1

AVERAGE AMOUNT OF TIME SPENT TEACHING MATH AND SCIENCE

State	Math Grades 1-3 Hrs./Wk.	Science Grades 1-3 Hrs./Wk.	Math Grades 4-6 Hrs./Wk.	Science Grades 4-6 Hrs./Wk.
Alaska	4.7	2.9	4.9	2.8
Idaho	4.7	2.4	5.5	3.9
Montana	5.3	2.2	4.8	3.7
Oregon	4.5	2.2	4.5	2.8
Washington	4.8	2.5	4.1	2.6

Standard errors for national average are .05 math, .05 science.

Sources: NCES, Schools and Staffing Survey, Public School Teachers, Spring 1991. Council of Chief School Officers, State Education Assessment Center, Washington, D.C., 1993

RESULTS REPORTED

Hours of class time reported are state averages of teacher-reported hours spent teaching the subject 'last week' in self-contained elementary classes. Data is broken down by early elementary grades one through three and upper elementary grades four through six for mathematics and science in each of the five Northwest states.

FINDINGS

Findings reported in Table 3.1 indicate that teachers spend an average of 45 minutes to one hour per school day on mathematics during the elementary years. Overall, math instructional time was approximately the same in early and upper elementary grades. Teachers spend significantly more time on mathematics than science in grades one through six. In Idaho, Montana, and Oregon, students in grades one through three spend approximately half as much time on science as mathemat-

ics. In grades four through six students still spend significantly more time on mathematics than science, however, the differences in time spent on math and science are somewhat less.

Secondary Course-Taking Patterns

Course-taking patterns are tracked in some Northwest states, and others will be collecting this type of data in the ensuing years. Nationally, eighth-graders who take an algebra course have consistently higher average proficiencies than students enrolled in less advanced mathematics classes. From data reported to the Council of Chief State School Officers (CCSSO) Indicators Reports from Oregon, Idaho, and Montana, there is limited information on course-taking patterns in middle and high schools. The three states report that students in grades seven through 12 typically take Pre-Algebra, Algebra 1, Geometry, and Algebra 2. In science at the middle and secondary level students generally complete life science, physical science, earth science, and biology. In the future, a comparison of regional course-taking patterns will provide greater insight to high school mathematics and science in the Northwest.

MATHEMATICS AND SCIENCE TEACHERS

Mathematics and science teachers' professional involvement was investigated by obtaining data on teachers in the field and their participation in professional associations. The number of teachers with instructional responsibilities for mathematics and science was used as a baseline for potential membership in professional associations. Although there are many avenues for teachers to remain current in their fields and obtain information on emerging trends and opportunities, the nationally linked professional organizations are an ideal way for teachers to keep in touch with other professionals and enhance their own teaching. Tables 4.1 through 4.3 report information on teachers in the field and their current involvement in professional associations.

NORTHWEST TEACHERS IN THE FIELD

TABLE 4.1

NORTHWEST TEACHERS BY ELEMENTARY, SECONDARY, MATH, AND SCIENCE SPECIALTY

State	Total [a]	Elem./ Middle K-8	Sr. High 9-12	Math & Computer 9-12 [b]	All Sci. 9-12	Biol.	Chem.	Phys.	Earth/ Geol.	Gen. Sci.	Phys. Sci.	Int. Sci.
AK 1994	7,864	2,976	4,018	432 (67)	371	94	29	13	30	140	55	NA
ID 1993	11,807	5,798	6,009	1060 (148)	809	278	134	97	165	20	115	NA
MT 1993	9,900	6,119	3,781	658 (69)	837	267	162	141	195	22	31	19
OR 1993	28,342	17,957	7,530	1,513 (173)	1,344	382				351	299	156
WA 1993	45,000	27,000	18,000	3,500	2,800							
Total	**102,913**	**59,850**	**39,336**	**Math 7,163 (457)**	**6,161**							

[a] Totals may include teachers not assigned K-8 or 9-12 such as music teachers, special education teachers, gym teachers, etc.
[b] The number of computer science teachers out of the total is in parentheses.

Sources: Alaska—Alaska Department of Education, data for 1994-1995; Idaho, Montana—CCSSO Indicators Report, 1994; Oregon—*Oregon Report Card 1993-1994*, ODE; Washington: Office of the Superintendent of Public Instruction

RESULTS REPORTED

Northwest teachers of mathematics and science account for a sizable portion of total teachers in the field. The data reported in Table 4.1 was obtained directly from state departments of education for the five Northwest states. Figures are for the most recently tabulated year, 1993

or 1994. The number of teachers is disaggregated first by grade level, breaking down into two levels of elementary-middle (K-8) and senior high (nine through twelve) teachers. The high school teachers are further grouped by those teaching mathematics and computer classes, and by teachers assigned more than 50 percent of their time to any science subject area. The seven columns on the far right of Table 4.1 depict patterns in assignments among science subjects for states that collect data along these parameters. Specific science fields reported are: biology, chemistry, physics, earth science and geology, general science, physical science, and integrated sciences.

FINDINGS

Of the 102,913 teachers in the Northwest, more than 50 percent teach in Washington, coinciding with the population pattern. An estimated 44,605 teachers are assigned to teach kindergarten through sixth grade. All of these teachers, as part of the elementary curriculum, teach science and mathematics. In each Northwest state there are more high school teachers than elementary and middle school teachers. Of the total number of high school teachers about 33 percent teach mathematics and/or science. Overall, there are more high school math teachers than science teachers in the region, although these totals are impacted by significantly more high school math teachers than science in Idaho and Washington. Conversely, in the other three Northwest states, science teachers outnumber math teachers in the high schools. For the four states that report data on science teacher assignments, biology requires more teachers than the other science subject areas. Subsequent numbers of teacher assignments in science vary based on state graduation requirements. Including all elementary teachers, estimated middle school teachers, and high school teachers, approximately 63,665 (62%) teachers in the Northwest have teaching responsibilities for mathematics and/or science.

TEACHERS' PARTICIPATION IN PROFESSIONAL ASSOCIATIONS

TABLE 4.2

PROFESSIONAL MATHEMATICS TEACHER ASSOCIATIONS

Association	Members (1994-'95)	% K-12 Teachers with Membership [a]	Annual Dues
National Council of Teachers of Mathematics (NCTM)	110,000		$45.00
Alaska (ACTM)	225	6%	$10.00
Idaho (ICTM)	700	10%	$15.00
Montana (MCTM)	600	9%	$15.00
Oregon (OCTM)	1487 [b]	11%	$15.00
Washington (WSMC)	1000	3%	$15.00

[a] % of K-8 teachers and 9-12 math teachers with membership in associations
[b] In addition, 600 members outside of state, 100 members outside of U.S.

Sources: Individual contact with each professional organization

RESULTS REPORTED

Although the National Council of Teachers of Mathematics (NCTM) does not report membership by state, 110,000 Northwest teachers belong to the national organization, as reported in Table 4.2. Affiliate councils of the NCTM are found in all Northwest states. Membership in state councils is also reported on Table 4.2. While membership is open to anyone, Table 4.2 indicates percentages of teachers most likely to enroll in the organizations. Percentages are based on the number of members compared to the total number of all teachers responsible for mathematics in each state.

FINDINGS

Membership in the NCTM is open to any teacher interested in mathematics teaching. Annual dues are minimal, and NCTM members receive an excellent publication and convention discount. Each

branch council also sponsors a publication, educational events for students, and professional opportunities for teachers. State NCTM councils connect fellow mathematics teachers with current resources, opportunities, and initiatives locally and within each state. Although annual dues are minimal, membership is extremely limited. Participation ranges from a minimum of 3 percent to a maximum of 11 percent of mathematics teachers in the states. The affiliated associations report that their memberships fluctuate to some extent according to the location of the state's annual conference. If the conferences are located near a metropolitan area, attendance and membership increase. Oregon has the highest membership of the state mathematics professional associations with additional members outside the state and nation. Membership was reported to be mostly mixed in terms of teaching assignment, with about half the members teaching K-8 and the other half teaching in the high schools.

TABLE 4.3

PROFESSIONAL SCIENCE TEACHER ASSOCIATIONS

Association	Members (1994-'95)	% of K-12 Teachers with Membership [a]	Annual Dues
National Science Teachers Association (NSTA)	51,000		$52.00
Alaska (ASTA)	171	5%	$15.00
Idaho (ISTA)	500	8%	$10.00
Montana (MSTA)	575 [b]	8%	$10.00
Oregon (TOST)	850	11%	$25.00
Washington (WSTA)	1400	4%	$15.00

[a] % of K-8 teachers and 9-12 science teachers with membership in associations
[b] In addition, 10 members out of state

Sources: Individual contact with each professional organization

RESULTS REPORTED

As in the case of the NCTM, the National Science Teachers Association (NSTA) membership is not reported by state but as total membership. Membership in state science teachers associations affiliated with NSTA is reported for all Northwest states. Paralleling the math teacher associations, membership is open. To gauge participation, Table 4.3 notes the percentage of teachers who are members based on potential membership by all elementary teachers and middle and high school science teachers.

FINDINGS

Although the NSTA has almost half the members nationwide as the NCTM, membership levels in the Northwest are comparable to the math associations. Annual dues are within the same range, although the Oregon science teachers' dues are slightly higher than the typical $10-$15. Fees do not seem to hinder membership. For example, Oregon has the highest annual dues and the highest percentage of membership in the region, with twice the membership rate of Alaska and Washington.

Again, paralleling the NCTM profile, the science teacher associations report that their memberships fluctuate to some extent according to the location of the state's annual conference. If the conferences are located near a metropolitan area, attendance and membership increase. Membership is reported to be mostly mixed in terms of teaching assignment, and about half the members teach K-8 and the other half teach in the high schools.

TEACHER CERTIFICATION

Certified teachers are important components of the educational system especially when considering trends and reform in teacher preparation and certification standards. The demand for new teachers in mathematics and science rests on issues related to currently certified teachers, such as schools' need for experienced teachers, age of the current teaching force, areas of endorsements, teaching assignments, and equity. In spite of the importance of depicting currently certified teachers, it is extremely difficult to portray certification numbers in the Northwest. Each state tracks certification data in idiosyncratic ways that do not necessarily lend themselves to comparisons across states. The capability and priority within each state to collect and report certification data varies greatly. For instance, detailed reports on certification are published annually in Washington, while in Alaska certification data is not publicly reported.

Collecting and reporting information on currently certified and employed teachers is critical to understanding the reality of who is teaching students in each state and the region as a whole. As minority populations grow and increasing evidence points to the benefits of an inclusive teaching force, depicting the nature of mathematics and science faculty takes on greater importance. States that are now taking steps to track data on teachers are to be applauded. Professionals in a variety of roles benefit from having readily available information to use for reform efforts in licensure, teacher preparation programs, certification policies, and special projects related to the professional development of teachers.

A general picture of currently licensed teachers in the field can be drawn by using the limited data that is available. Overall, licensed mathematics and science teachers reflect characteristics of the teaching force across the country, yet also reveal glaring differences. As in the country as a whole, most elementary level teachers in the Northwest are white females. Historic and current data on the Northwest collected in the *State Indicators of Science and Mathematics Education* from the Council of Chief State School Officers (CCSSO)

indicates that minority teachers in secondary mathematics and science are extremely rare in the region. Unlike many regions of the United States, most Northwest states have very low percentages of minority student populations, and minority teachers in mathematics and science are represented in even smaller numbers. Similar to many states, most secondary teachers of mathematics and science in the Northwest states are male. However, female mathematics and science educators are even more uncommon in the Northwest than other regions. Women are more equally represented as teachers of mathematics than science. However, typically there are half as many female mathematics teachers as male. In the sciences the discrepancy is even greater, with one-fourth to one-third the number of women as men teaching science subjects.

Most Northwest states track numbers of elementary certificates awarded annually. Idaho, Montana, and Washington also tabulate endorsements to teach specific subject areas, such as mathematics and science at the secondary level. While the number of elementary certificates across the states in the Northwest region has increased in the last four years, greater fluctuations exist in mathematics and science endorsements issued annually. Information about newly certified teachers is of particular interest. Unfortunately, few states separate new certificates from others. The following highlights elementary certificates and certification information reported by each state. When possible, data on new certificates and endorsements is included.

Elementary Teacher Certification

TABLE 5.1

ELEMENTARY CERTIFICATES

	Number of Certificates Issued by Year				Currently Employed K-8 Teachers
State	1990-'91	1991-'92	1992-'93	1993-'94	1993-'94
Alaska [a]					
Idaho	3,227	3,215	3,178	3,125	5798
Montana	535	593	662	694	6119
Oregon	4,447	4,385	4,446	4,393	17,957
Washington		2,961	3,067	3,465	27,000
Total		**11,154**	**11,353**	**11,677**	**56,850**

[a] Alaska does not report these figures.

Most states track initial certificates for elementary teachers (generally a licensure for teaching kindergarten through eighth grade). These initial certificates are awarded to individuals who have not previously been licensed in the state. Over the four years depicted, the number of new certificates was relatively stable for Idaho, Montana, and Oregon. Washington reported a steady increase in the number of new elementary certificates from 1991 to 1994.

Idaho appears to be certifying a high number of elementary teachers on an annual basis. Compared to the number of elementary teachers currently teaching in the state, more than half that number were additionally certified each year. Oregon also appears to be certifying more teachers than will be placed in that state. The number of newly certified elementary teachers in Montana and Washington likely more closely meet the demand for new teachers.

Alaska Teacher Certification

Alaska does not report publicly on new or current certification numbers.

Idaho Teacher Certification

Idaho collects and reports data on licensure by numbers of elementary certificates as well as secondary mathematics and science endorsements. New certificates are not reported separately.

TABLE 5.2

IDAHO TEACHER CERTIFICATES

Endorsement	Number of Certificates Issued by Year			
	1990-'91	1991-'92	1992-'93	1993-'94
Standard Elementary	3,528	3,804	3,930	4,100
Advanced Elementary	3,227	3,215	3,178	3,125
Standard Mathematics	887	926	958	976
Basic Mathematics	17	18	18	21
Total Science	2,007	2,016	2,117	2,086
Biological Science	643	641	657	663
Earth Science	93	98	155	110
Natural Science	902	897	915	922
Physical Science	369	380	390	391

The Idaho Standard Elementary certificate is the initial certificate for grades one through six. The number of these certificates decreased gradually over the last four years. On the other hand, the number of Advanced Elementary certificates in 1993-1994 showed an increase of over 500 since 1990-1991. Most Idaho mathematics endorsements are in Standard Mathematics. These certificates have shown a steady increases recently from 887 in 1990-1991 to 976 in 1993-1994.

Science endorsements have followed a similar pattern, with gradual increases reported in all science subject area endorsements.

Montana Teacher Certification

Montana tracks new certificates broken down by grade level and year. The number of newly certified elementary (grades one through eight) teachers in Montana has more than doubled since 1989 when there were 333 new certificates were issued. During the 1993-1994 school year, 694 new elementary certificates were issued.

TABLE 5.3

MONTANA NEW CERTIFICATES

Endorsement	Number of Certificates Issued by Year				
	1989-'90	1990-'91	1991-'92	1992-'93	1993-'94
Elementary	333	535	593	662	694
Mathematics	60	67	88	93	76
Total Science	78	99	133	124	90

New secondary (grades five through 12) endorsements have increased in mathematics over the last five years, although that trend seems to have reversed during 1993-1994. A substantial increase in new mathematics endorsements occurred from 1989-1993. Beginning in 1989, mathematics endorsements increased annually from 60 to 67 and then from 88 to 93 endorsements in the 1992-1993 school year. However, during 1993-1994, the number of new mathematics endorsements dropped to 76.

New science endorsements at the secondary level in Montana followed a similar pattern, with significant increases in numbers of science endorsements increasing from 78 in 1989-1990 to 99 in 1990-91, then a major increase to 133 in 1991-92. New science endorsements

decreased in 1992-93 to 124 and again in 1993-94 to 90. It is interesting to note that although new elementary certificates in Montana have increased dramatically in the last five years, endorsements in mathematics and science peaked in 1992 or 1993 and have waned in recent years.

OREGON TEACHER CERTIFICATION

Oregon reports the number of certificates issued by year, but does not break out new certificates or report endorsements in mathematics or science. Oregon appears to have experienced a fairly stable number of certificates issued annually over the last five years. The lack of information on newly certified teachers and endorsements in mathematics and science prohibits drawing conclusions on any related trends or patterns.

TABLE 5.4

OREGON TEACHER CERTIFICATES

Endorsement	Number of Certificates Issued by Year				
	1989-'90	1990-'91	1991-'92	1992-'93	1993-'94
Basic—Elementary	4,155	4,447	4,385	4,446	4,393
Basic—Other	4,328	4,454	4,134	4,188	3,897
Standard—Elementary	310	331	304	332	307
Standard—Other	3,005	3,327	3,090	3,369	3,383

The Basic license is the most frequently issued certificate in Oregon. It is an initial certificate with an endorsement to teach kindergarten through eighth grade or other specific endorsements. The annual number of Basic—Elementary licenses issued varied by only 50 to 60 licenses from 1990-1994. During the 1993-1994 school year, 4,393 licenses of this type were issued. The Basic—Other licenses include mathematics and science endorsements, as well as other subject area endorsements. The number of these licenses has also fluctuated, with

the total down to 3,897 from a high in 1990-1991 of 4,454. The advanced certificate in Oregon is the Standard. The number of Standard licenses has been very stable in recent years. Numbers of Standard—Other are currently up slightly with 3,383 licenses issued in 1993-1994. Standard—Elementary licenses are far fewer than the other types. The number of Standard—Elementary licenses has ranged from 304 in 1991-1992 to 332 in 1992-1993. Although there are fewer licenses issued, the Standard-Elementary has fluctuated in the 304-332 range for the last five years.

Washington Teacher Certification

In Washington, the Superintendent of Public Instruction in collaboration with the Professional Education and Certification publishes an annual report entitled *Certificates Issued and Certificated Personnel Placement Statistics*. The report depicts certificates issued for various roles and placement statistics for graduates of Washington teacher education programs. Data is broken down by type of certificate, new licenses, in-state and out-of-state certificates, and specific endorsements. Table 5.5 summarizes licensure data on new certificates.

TABLE 5.5

WASHINGTON NEW CERTIFICATES

Endorsement	Number of Certificates Issued by Year			
	1989-'90	1991-'92	1992-'93	1993-'94
Elementary	3,160	2,961	3,067	3,465
Mathematics	357	296	347	374
Total Science	659	549	623	699
Biology	282	253	262	294
Chemistry	88	78	73	101
Earth Science	60	42	61	67
General Science	175	131	162	164
Physics	54	45	65	73

Table 5.5 illuminates trends in certification over recent years. Overall, the number of certificates slightly decreased in 1992-1993 from 1989-1990, although in 1993-94 certificates in nearly all fields were at their highest levels in recent years. Elementary education, mathematics and all sciences, except chemistry, saw a drop in the number of certificates issued in 1991-1992. As in other states, elementary education has had the highest number of certificates issued of all new endorsements. Physics and earth science had the fewest new endorsements of the sciences, although physics endorsements showed the greatest increased numbers from 1989 to 1993. Biology consistently has the most certificates of the sciences.

DEPICTION SUMMARY

The Northwest is a diverse region of contrasts and commonalities, and the factors contributing to the state of education in the region are complex and interactive. They must be combined with a qualitative perspective of professionals in the field to draw a dynamic portrait of science and mathematics education in the Northwest. However, by investigating a limited number of dimensions, a cursory perspective can be gained about the region that is served by the Northwest Regional Educational Laboratory.

Demography

With more than one-fourth of the nation's land mass, the Northwest is home to only 4 percent (11 million) of the country's people. The population density ranges from 1.1 people per square mile in Alaska to 78.9 people per square mile in Washington. Public school enrollment in the region has grown over the last five years and continues to grow slowly. Since population is concentrated in a few urban areas, most students attend urban schools. However, due to the region's vast area, most schools are in rural areas. As school populations continue to grow, particularly in urban areas, teachers need to be prepared to work with a changing population of students. The minority student population is growing faster in the Northwest than in the nation as a whole. Alaska currently has the largest minority population of 22.4 percent Native Americans. Washington has the greatest variation in student population with 16.6 percent total minority students distributed among Asian/Pacific, Black, Hispanic, and Native American ethnic and racial backgrounds.

Assessment

Northwest students achieved slightly higher than the national average in mathematics norm-referenced tests, National Assessment of Educational Progress (NAEP) tests, and the Scholastic Achievement Test (SAT) tests. Students across the region obtained higher scores on standardized tests than the average U.S. student in science. Overall,

science achievement was higher than mathematics, although a more limited sampling of students were administered science achievement tests. Eighth-grade students in all states scored comparatively higher than the elementary or high school students on standardized tests. Results from the NAEP trial tests indicate that although eighth-grade Northwest students achieved at a higher level than the average U.S. student, the averages are still significantly below established NAEP proficiency levels for grade eight. The percentage of students taking the SAT ranges from 16 percent in Idaho to 53 percent in Oregon. The variation is accounted to state higher education entrance requirements and trends of students going out of state to college or universities. SAT scores have remained stable over recent years, with most Northwest students scoring above the national average on the SAT math and verbal tests combined. The ratio of girls to boys taking the SAT is fairly close across the region. Throughout the United States, more female than male students take the SAT.

Student Participation

At the elementary level students spend 45 minutes to one hour per school day on mathematics. Instructional time in science is about half that or about half an hour per day. In upper grades instructional time is restricted by classes students are enrolled in. The CCSSO reports suggest that in mathematics, middle and high school students typically take Pre-Algebra, Algebra 1, Geometry, and Algebra 2. The highest scoring students on the SATs took calculus as well. Typically, twice as many male as female students who took the SAT took computer mathematics. In science, middle school students generally take life science and physical science. Most high school students complete earth science and biology with many students also taking chemistry. The highest scoring SAT students also took physics.

Mathematics and Science Teachers

Of the 102,913 teachers in the region, more than half teach at the K-8 level. Teachers of mathematics and science in the Northwest account for about two-thirds of all teachers. The high school science subject that warrants the most teachers is biology. Participation in professional

associations in the Northwest is limited. Membership in both NCTM and NSTA state affiliates ranges from 3 percent to 11 percent of teachers currently teaching mathematics or science. Although some teachers belong to the national organization and not the state association, this is a limited number of teachers. A small percentage of teachers belong to other environmental or general education associations, but the emphasis on mathematics and science is more restricted in these organizations. It is clear that participation in professional associations, although rewarding for members, is currently not an avenue of professional interaction, collaboration, or learning for most Northwest teachers.

Teacher Certification

Enormous differences exist in the documentation of teacher certification data in the Northwest states. Alaska does not report such data. Washington prepares an annual report that summarizes certification data. Other states fall somewhere between Alaska and Washington in their tracking of teaching certificates. Drawing from this mixed approach to data documentation, some trends are evident. Interestingly, in Washington and Montana where new certificates are tracked, the number of newly certified teachers probably more closely matches the states' need for new teachers than in other states. Idaho and Oregon are proportionally certifying the highest number of teachers in the Northwest region. For all reporting states, the number of teaching certificates in elementary, mathematics, and science education have steadily increased in recent years across the region. In sciences, biology endorsements are more common than other areas.

Closing

This depiction of Northwest teachers combined with evidence of changes in student population, achievement, and curricula point to the need for far-reaching, high quality professional support, such as the Northwest Regional Educational Laboratory continues to provide the Northwest region. By continuing to provide information on various interacting components of the regional educational system, reform efforts can be based on current conditions.

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